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The Files

7 September 1962

25X1A9a [redacted]

25X1A5a1 Conference Report - [redacted], Adapticom Anti-Multipath System

1. On 5 September 1962 a short meeting was held in Alcott Hall with a representative of [redacted] 25X1A 25X1A [redacted] to discuss their new anti-multipath system. Present were:

Dr. [redacted] 25X1A5a1
Mr. [redacted] - OC-E 25X1A9a

25X1A5a1 Dr. [redacted] currently holds an Agency Association Only clearance so the writer did not discuss the peculiar aspects of Agency interest in anti-multipath systems. A full secret clearance has been requested for Dr. [redacted] as of 4 September 1962. A secrecy agreement was obtained from Dr. [redacted] 25X1A5a1 25X1A5a1

2. The Adapticom system is basically a time varying matched filter communications system for HF and wire line use. In operation, a 400μsec pulse is sent by the field who then does not transmit for 5 ms. At the receiver a smeared version of the 400μsec pulse is received, lasting perhaps 4 ms or more. This dispersed signal approximates the impulse response of the channel. The signal is inserted into a tapped delay line and when fully inserted, is used to set the gain of the taps of the line to a time reversed replica of the incoming signal. The taps are electronically set in only a few microseconds. Then another 400μsec pulse is sent. The signal which is now received at the output of the matched filter is inserted into a second tapped delay line which is then automatically adjusted to a characteristic approximating the reciprocal of the transfer function of the cascade of the channel and the matched filter. It may be shown that the resultant receiver filter is optimum in that no other filter can correct for phase and amplitude distortion as well. After setting up the two delay lines, the system is now ready for data transmission.

3. Data may be sent so long as the channel parameters do not change appreciably from the values used to set up the matched and reciprocal filters. Measurements of HF data indicate that at least 100 ms of data transmission time is available before a typical HF channel has changed sufficiently to render the receiver delay line tap settings invalid after 100 ms; therefore, two more "measurement" pulses spaced by 5 ms are sent and used to reestablish proper receiver operating conditions. (Clearly if the channel

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fading rate were less than 10 cps, the receiver would not have to be adjusted so often.) Thus, Adapticom provides a step-wise in time approximation to the ideal optimum continuously time varying matched-reciprocal filter receiver.

25X1A5a1 4. Dr. [redacted] showed the writer photographs of system performance over a simulated HF link. Without Adapticom multipath smeared the received data waveform so badly that it was no longer decipherable. With Adapticom the data waveform was perfectly readable.

5. The fact that the delay lines may be set upon a noisy pulse needs consideration. It may be shown that using a noisy signal for channel measurement results in approximately an equivalent 3 db power loss compared to operation with a noise-free matched filter, a figure more than compensated for by the gain advantage of the matched filter technique.

6. Several Government agencies are interested in Adapticom, among them being NBS, NSA, Signal Corps, NAVY (Bu Ships), USASRDL (COMSEC), and Defense Communications Agency (DCA). DCA is spending about $100,000.00, being matched by another Government group, for development of an experimental short haul HF communications system using Adapticom techniques. Mr. Joseph Karcek of DCA is in charge of the work on the part of the Government. Work on the contract has not started yet.

7. It is the opinion of the writer that Adapticom, if successful, represents an important breakthrough in anti-multipath communications. All indications to date are that the system will be highly effective, permitting data rates on the order of a minimum of 1,000 words per minute per KC of bandwidth in the presence of heavy multipath. Theory would indicate that 4,000 words per minute per KC of bandwidth is possible, although 1,500 to 2,000 words per minute probably would be a real-world upper limit on rate.

8. It is therefore recommended that [redacted] progress on Adapticom be closely monitored. Should the short haul HF tests 25X1A5a1

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be successful, consideration should be given to Adapticom for possibly meeting Agency high-speed HF/wire line transmission requirements in a multipath environment.

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